

## REMARKS

### **Claim Amendments**

All of the claims have been amended so that the claims are directed to catalyst members including a coating of catalytic material. Claim 1 now includes the limitations that the carrier comprises a tube having an elongate body portion which is dimensioned and configured to be in a bent or curved configuration along its length within a bent or curved portion of an exhaust pipe having an open discharge end and that catalytic coating applied to the carrier remains intact on the carrier when the carrier is bent along its length. Independent claim 34 has been amended to recite that the catalyst member is conformable along its length so that it can be placed in a bent or curved configuration to provide intimate contact of the exhaust gas with the catalytic coating of conformable catalyst member to promote reactions to convert noxious components of the exhaust gas and retain the catalytic coating on the carrier.

### **Claim Rejections in the Examiner's Answer**

Applicants believe that all of the claims are patentable over the references cited in the Examiner's Answer and that a prima facie case of obviousness has not been established. In addition, a declaration is submitted which, in paragraphs 5-10, establishes unexpected results of the claimed invention and addresses the references cited in the Examiner's Answer. Applicants reserve the right to file a continuation application to pursue the claims pending at the time of filing of the appeal brief.

Claims 1-3, 5-6, 30-36 in this application stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Ishida et al. (U.S. Patent No. 4,455,281, referred to as "Ishida" herein) in view of EP 0831211. Claim 36 has been cancelled in this amendment. This rejection is respectfully traversed.

### **Claim 1**

Claim 1 now includes the limitations that the carrier comprises a tube having an elongate body portion which is dimensioned and configured to be mounted within a bent

or curved portion of an exhaust pipe having an open discharge end and that catalytic coating applied to the carrier remains intact on the carrier when the carrier is bent along its length. Conformable means that the carrier containing the catalyst can be bent to the shape of a curved or bent configuration. Claim 1 and the claims depending therefrom now explicitly recite a catalyst member that can be bent along its length and retain the catalytic coating intact.

The examiner admits that Ishida does not teach a tube of corrugated construction. Applicants emphasize that Ishida fails to teach a catalyst member that can be placed in a bent or curved configuration in a bent or curved portion of an exhaust pipe and retain the catalytic coating on the carrier. Ishida specifically states that the thickness of the metal plate "is preferably thin, but **toughness of the metal plate is required in order not to easily yield to deformation.**" (col. 4, lines 51-53 (emphasis added).)

On this point, please refer to the Rule 132 Declaration of Michael P. Galligan, a co-inventor for the instant patent application. Paragraph 12 of the Galligan Declaration notes that Ishida makes a distinction between metal plates (reference number 5) and a catalyst unit (reference numeral 3) which is a metal plate 5 with a catalyst substance (reference number 11) on the metal plate 5. In Figures 3 and 4, the metal plates (not catalyst units are shown as being bent prior to application of a catalyst substance 11. There is no teaching or suggestion in Ishida of a catalyst member containing catalytic coating that can be placed in a bent or curved configuration and retain the catalytic coating intact.

Moreover, the carrier plates shown in Figures 3 and 4 of Ishida are corrugated, but Figures 3 and 4 do not disclose or suggest catalyst members that can be bent along their length and retain the anchor layer on the carrier when the carrier is bent. A person of ordinary skill in the art reviewing the specification and Figures 3, 4, 22, and 23 of Ishida would be motivated to provide rigid plates that can be arranged in a stacked array.

The Galligan Declaration also discusses at paragraphs 14-16 the tertiary references relied upon by the Examiner to support the proposition that metal plates can be tough and flexible at the same time. As referenced in the Galligan declaration, none of

these references cures the statement in Ishida that the plates should not yield to deformation, which is a function of the thickness of the plates. As discussed above and in the Galligan Declaration at paragraphs 12 and 13, Ishida teaches that the plates should be sufficiently thick and tough so that the plates do not easily yield to deformation.

The Galligan declaration addresses at paragraphs 17-18 EP 0831211, which is cited in Examiner's Answer for the alleged teaching that an exhaust emission control device can have a catalytic metal bearing (or support) member which can be corrugated tube shape, citing item 13 in Figure 4 or item 22 in Figure 7). The Galligan declaration specifically addresses Figure 4, and Figures 16A and 16B. Specifically, none of these structures are bendable along their length and retain the catalytic coating intact. As noted in the Galligan Declaration and discussed further below, rigid tubes similar to the tubes shown in EP0831211 do not perform as well as catalysts when placed in the exhaust pipe of a small engine.

In the Examiner's Answer at page 15-16, it is asserted that item 13 in Figure 4 of EP0831211, which is an uncatalyzed cushion member, can be substituted for the spacers in Ishida. Applicants note that in EP 0831211, the corrugated sheet, item 13 in Figures 4 and 7, serves as a cushion for catalytic bearing member 22, which is in the form of cylinder. There is **no** teaching or suggestion in EP 0831211 of a corrugated tubular carrier that includes an intermetallic anchor layer capable of retaining a catalytic coating applied thereto intact on the carrier when the carrier is bent and adapted for use in a conformable catalyst member. While item 13 in Figures 4 and 7 is a corrugated sheet, it **does not have a catalytic layer** or an intermetallic layer formed thereon and thus cannot be considered to be a carrier having an intermetallic layer thereon. It is acknowledged that column 5, lines 30-35 mention that item 22 is "resiliently deformable", however this is in the context of the tube being radially deformed while it is being inserted into internal pipe 11. This structure would be rigid along its length and could not be bent along its length to be inserted into a curved or bent exhaust pipe.

Further, it is unclear how a cylindrical support member 13 in Figures 4 and 7 of EP083211 could be substituted for the spacers in Ishida when flat plates are piled up.

The Examiner's Answer at page 15 states that the support member 13 would eliminate the need for spacers, but it is submitted that this reasoning is not persuasive because this would be substitution of one part for another, not the elimination of a part. Furthermore, cylindrical support members 13 would not serve a proper function as spacers for flat cylindrical plates.

Applicants respectfully submit that the tubular carriers disclosed in EP 0831221 are similar to those disclosed in Applicants' specification at page 13, lines 25-28, which teaches that the carriers comprising a tube of corrugated construction can be used in curved portions of exhaust systems together with rigid, tube-like catalyst members, which would be used in straight sections of the exhaust systems. Since neither Ishida nor EP 0831221 teaches or suggested a carrier comprising a corrugated tube, the Examiner has failed to establish a *prima facie* case of obviousness.

Accordingly, EP 0831211, like Ishida, fails to teach a catalyst having an intermetallic anchor layer for retaining a catalytic material when the carrier is bent along its length. The carriers of the catalytic bearing members in EP 0831211 are in the form of cylindrical sheets that are spot welded to corrugated sheet cushion member 22 so that the cushion member 24 deforms relative to the member 22 in the radial direction to accommodate different amounts of thermal expansion between the exhaust pipe 5 and the catalytic member 22. (col. 7, lines 1-10.) Such a construction, in which the corrugated cushion member is fastened to the cylindrical catalytic member would not provide a carrier for use in a conformable catalytic member, but instead one that is rigid. Since the cylindrical substrates shown in EP 0831211 are not corrugated or adapted to be used in a conformable catalyst member as required by Applicants' claim 1, EP 0831211 fails to cure the deficiencies in Ishida, the Examiner has failed to establish a *prima facie* case of obviousness.

### **Claims 2-3, 5-6 and 31-33**

For at least the reasons provided above with respect to claim 1, claims 2-3 5-6, and 31-33, all of which depend from claim 1, are patentable over the cited art. With respect to claim 2, EP0831221 does not teach a tube have a perforations around it

periphery. Regarding Figure 16D, the Galligan Declaration addresses this structure in paragraph 19 of the Declaration. The structure shown in Figure 16D does not meet all of the limitations of the claims, namely, a catalyst member that is bendable or conformable and that retains the catalytic coating on the carrier when the carrier is bent or curved.

Regarding claim 5, EP0831221 does not teach alternating rings separated by annular webs. The examiner's statement that it would have been obvious to shape the catalyst this way assumes through the use of improper hindsight what has not been shown in the combined teachings of the references.

Regarding claim 31, Ishida and EP0831211 do not teach or suggest a carrier having an elongate body portion which is dimensioned and configured to be mounted within a curved or bent pipe having an open discharge end, the carrier having coated thereon an anchor layer suitable for having a catalytic coating applied thereto, the carrier having a distal end and a proximal end, the proximal end comprising a mounting member dimensioned and configured to be secured to the open discharge end of the pipe when the body portion of the carrier is disposed within the pipe.

Regarding claim 32 and 33, Ishida and EP0831221 do not teach or suggest the mounting member comprises an annular collar defining a mounting flange which is disposed radially outwardly of the proximal end of the catalyst member. The examiner fails to provide any statement or reasoning as to why these claims are rejected.

#### **Claim 34**

Independent claim 34 is not taught or suggested by Ishida and/or EP0831221. Claim 34 now contains the limitation that the catalyst member is conformable along its length so that it can be placed in a bent or curved configuration to provide intimate contact of the exhaust gas with the catalytic coating of conformable catalyst member to promote reactions to convert noxious components of the exhaust gas and retain the catalytic coating on the carrier. Claim 34 also requires a refractory metal carrier comprising a plurality of perforated plate members having opposite faces and disposed in a face-to-face linear array to impart a cylindrical shape to the carrier and to form accordion pleats, the plate members having protrusions extending from their faces which

space adjacent plate members from each other. For at least these reasons, claim 34 is patentable over the cited references. Withdrawal of the rejection is respectfully requested.

**Claims 30 and 35**

Claims 30 and 35 stand rejected as allegedly being obvious over Ishida in view of EP0831211 further in view of Donomoto et al. U.S. Patent no. 4,798,770 (“Donomoto et al.”) or Draghi U.S. Patent no. 6,042,879 (“Draghi et al.”). Donomoto et al. or Draghi et al. are cited for the teaching of an anchor layer comprising nickel and aluminum.

The deficiencies of Ishida and EP0831211 are noted above with respect to claims 1-3, 5-6, 31-34 and 36. The Galligan Declaration refers to Donomoto et al. and Draghi et al. at paragraph 19. Neither Donomoto et al. nor Draghi et al. cures these deficiencies. Donomoto et al. pertains to a heat resisting alloy article having a sprayed, alloyed layer formed over a composite fiber/light alloy layer. There is no teaching or suggestion of a carrier comprising a tube of corrugated construction or of the structure recited in claim 34. Draghi et al., like Ishida, teaches coating apertured articles, but not the type of refractory metal carrier as recited in claims 1 and 34.

**Rejection of Claims 1-3, 5, and 30-35**

In the Examiner’s Answer, claims 1-3, 5, and 30-36 were rejected as allegedly being unpatentable over Gorynin U.S. Patent No. 5,204,302 (“Gorynin”) in view of EP0831211, optionally further in view of Rondeau U.S. Patent No. 4,027,367 (“Rondeau”) and Ishida. Claim 36 has been cancelled. The Galligan Declaration discusses Gorynin and Rondeau at paragraph 19.

Gorynin is relied upon as allegedly teaching forming a catalyst member by corrugating a catalyst strip and rolling it into a cylinder, citing column 9, lines 64-68. As noted in the Galligan declaration, Gorynin does not teach or suggest providing a catalyst member that is bendable along its length and that can be inserted into a curved or bent exhaust pipe in a curved or bent configuration along its length and retain the catalytic coating layer.

### **Summary**

In summary, applicants respectfully submit that none of the cited references teach or suggest the limitations of a catalyst member comprising a carrier comprising a tube of corrugated construction, the tube having an elongate body portion which is dimensioned and configured to be mounted in a curved or bent configuration along its length within a bent or curved portion of an exhaust pipe having an open discharge end, the carrier having coated thereon an intermetallic anchor layer capable of retaining having a catalytic coating applied thereto which remains intact on the carrier when the carrier is bent along its length, as defined by claim 1. The cited references also do not teach a catalyst member as defined by claim 34, namely, a catalyst member comprising a plurality of perforated plate members having opposite faces and disposed in a face-to-face linear array to impart a cylindrical shape having a length to the carrier and to form accordion pleats, the plate members having protrusions extending from their faces which space adjacent plate members from each other, the carrier having coated thereon an intermetallic anchor layer and a catalytic coating, adapted for use in a conformable catalyst member the catalyst member being conformable along its length so that it can be placed in a bent or curved configuration to provide intimate contact of the exhaust gas with the catalytic coating of conformable catalyst member to promote reactions to convert noxious components of the exhaust gas and retain the catalytic coating on the carrier.

### **Unexpected Results**

In the event the above amendments and comments do not overcome the rejections of the claims, applicants respectfully submit that the claimed invention exhibits unexpected results as demonstrated by paragraphs 5-10 of the Galligan declaration and Exhibit A, attached thereto. In particular, the Galligan declaration describes the results of testing of a conformable catalyst member in a motorcycle engine compared to a rigid tube catalyst member, which is similar in construction to the tube catalyst members shown in EP0831211. In each test, the conformable catalyst member exhibited unexpectedly

superior HC and CO conversions compared to the rigid tubes. In paragraph 10, the HC conversion was two times better for the conformable catalyst member when compared to the rigid tube. As discussed in Exhibit A to the declaration, it is believed that tests demonstrate that the Flextube™ conformable catalyst member was able to deliver more emission reduction if it is located closer to the engine exhaust where the catalyst member can take full advantage of the turbulent flow and higher temperature. It is noted that the conformable catalyst members tested were tubular and similar in configuration to the catalyst members recited in claim 1 and the claims depending from claim 1. The Galligan declaration states that it is expected that a catalyst member having the configuration of claims 34 and 35 would be expected to perform better than a rigid catalyst member because it could be bent to take advantage of turbulent flow and be placed closer to the engine.

**Conclusion**

Reconsideration of the above-referenced patent application in view of the foregoing amendment and remarks is respectfully requested. It is not believed that any fees are due. If any fees are due, however, the USPTO is authorized to charge Deposit Account No. 50-3329.

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Respectfully submitted,

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